Refining the Age of a Mid Pleistocene Marine Abrasion Platform in West Hollywood, CA - Implications for Uplift, Geometry, and Kinematics of the Hollywood fault: Collaborative Research with William Lettis & Associates, Inc. and U. S. Geological Survey

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Scott C. Lindvall and John G. Helms
William Lettis & Associates, Inc., 28470 Avenue Stanford, Suite 120, Valencia, CA 91355
(661) 775-4990; (661) 775-4990 fax; lindvall@lettis.com, URL: www.lettis.com

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INVESTIGATIONS UNDERTAKEN

This collaborative study between WLA and the USGS is designed to better constrain age estimates of the marine abrasion platform and overlying sediment found in West Hollywood and to apply these new data to evaluating the late Quaternary activity, kinematics, and evolution of the Hollywood fault system. The Hollywood fault is one of the primary structural elements bounding the northern margin of the Los Angeles basin. Along with the Santa Monica fault, movement on this zone has produced uplift of the Santa Monica Mountains, including the Hollywood Hills. This has led some workers to interpret the Santa Monica-Hollywood fault zone as primarily a reverse or oblique fault while others have shown that the Santa Monica-Hollywood fault has experienced principally left-lateral strike-slip motion during the Quaternary. Understanding the current behavior and level of activity of the Hollywood fault is critical for assessing its seismic potential and the likelihood for producing a damaging earthquake in close proximity to the densely urbanized Los Angeles metropolitan region.

The USGS component of the study was to assist WLA in developing a sampling plan on these cores, and contribute to the design of a complementary drilling and sampling program. In addition, USGS is currently performing age dating and stratigraphic analyses on the core samples in a similar manner to which the USGS, under the auspices of the FOQUS-LA project, has successfully completed in Hancock Park and Long Beach. Daniel Ponti of the USGS is leading the collaborative USGS effort on this study.

This study involves the four primary tasks outlined below:

1) *Assessed of existing cores and geologic data for dating and stratigraphic analysis*
   The first phase of the project involved a thorough review and assessment of existing core stratigraphic and geochronologic data compiled from numerous fault hazard evaluations. Most of these previous studies were site-scale evaluations. We have combined the results of these independent studies into a coherent preliminary regional stratigraphic and structural model of the fault zone, as well as a GIS database of borings in the West Hollywood area. Core lithologies and condition were also screened to determine where and what kinds of dating approaches might be most suitable to constrain the marine platform age as well as ages of significant soil horizons or other marker horizons.

2) *Obtained additional core samples for TL/OSL dating*

We have completed the drilling and sampling of two additional borings to obtain properly sealed samples for TL/OSL dating and to obtain additional suitable material for paleomagnetic analysis. These two new core holes were drilled to depths of 240 feet and 50 feet using a hollow-stem auger rig. The borings were placed both directly north and south of a large, active (and possibly the main) strand of the Hollywood fault. The placement of the two borings on either side of the fault is designed to (1) date the age of the marine platform and overlying sediments and (2) estimate a sediment accumulation rate on the footwall that can be used as a proxy for uplift rate across the Hollywood fault. The cores were collected in opaque liners and subjected to handling and logging practices developed by the USGS for core-stratigraphic studies elsewhere in the Los Angeles region.

3) *Perform additional dating and stratigraphic analyses on new core samples*

The new core samples will be logged, analyzed, and prepared for TL/OSL dating by the USGS in Menlo Park. This effort will be led by Dan Ponti. The luminescence dating techniques (TL and OSL) will provide absolute ages that extend well beyond the range of radiocarbon and do not require the presence of organic material. Finite TL ages of up to 400 ka in both shallow marine and non-marine sediment have been successfully derived from similar lithologies in the Long Beach area and elsewhere. Paleomagnetic analyses will be performed to determine whether the marine platform predates the Bruhnes-Matuyama paleomagnetic boundary (780 ka). The combination of these approaches, coupled with a sequence-stratigraphic interpretation of the Pleistocene section using the marine isotope climate model should provide sufficient constraints to determine the sea-level high stand (Stage 9, 11, 13, 15, etc.) during which the West Hollywood platform formed and if it is correlative with either of the marine high stand deposits documented by Quinn et al. (2000) in the La Brea Plain. TL/OSL analyses will be compared to existing radiocarbon control in the upper part of the section as a check on the method and will provide absolute constraints on older soil ages previously estimated using SDI and MHI indicators. These additional ages will help to refine estimates of activity and timing on subsidiary structures associated with the main Hollywood fault.

4) *Stratigraphic and structural model development*

Following the dating and core analysis, we will develop a sequence-stratigraphic model of the Quaternary marine terrace and overlying fan deposits in the West Hollywood area. From the subsurface borehole data we will also construct (1) a structure contour map of the platform surface and (2) isopach maps of alluvial packages defined by distinct and correlative soil horizons in West Hollywood. These products will allow us to infer maximum throw, fault zone evolution, and uplift rates across individual fault strands of the complex Hollywood fault zone. The models will provide constraints in the development of plausible kinematic and structural models of the Hollywood fault to constrain dip-slip and shortening rates of the Hollywood fault and Santa Monica Mountains blind thrust.

NON-TECHNICAL SUMMARY

This study is investigating the age of a buried marine platform and associated shoreline deposits along the Hollywood fault zone within the City of West Hollywood. The relatively planar abrasion platform and overlying beach sand provide an excellent datum that has been offset across strands of the Hollywood fault zone. A more definitive age of the buried marine platform will allow us (1) to better to evaluate the late Quaternary activity, kinematics, and evolution of the Hollywood fault and (2) assess the likelihood of future damaging earthquakes in close proximity to the densely urbanized Los Angeles metropolitan region.

REPORTS PUBLISHED

None.